The burden of obesity on children health, its correlation to their age

La carga de la obesidad en la salud de los niños, su correlación con su edad

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Received/Recibido: 02/24/2021 Accepted/Aceptado: 03/15/2021 Published/Publicado: 04/10/2021 DOI: http://doi.org/10.5281/zenodo.5513953

Abstract

Background: Obesity among children is an escalated health issue in both developed and developing countries, it's one of the most prominent confront of the twenty-one century that is linked to numerous comorbidities.

Patients and methods: Ninety-six were involved in this survey twenty-seven were less than 6 years and sixty-nine were 6-18 years. All of them had a BMI more than 95% for their age and gender, they were clinically estimated as obese children. History, physical examination and investigation of the most relevant laboratory tests were performed later to consent acquisition. Results: There is significant difference in mean age group of the two groups, hypercholesterolemia and high triglyceride were more reported among patients older than 6 years. Hypertension, psychological impacts, sleep apnea, gastroesophageal reflux disease are more significantly reported among the older group (> 6 years). Iron deficiency anemia and asthma were more significantly correlated to the younger group (<6 years).

Liver enzyme abnormalities, gall stone, musculoskeletal pain show no statistical difference between the two groups.

Keywords: The burden of obesity; children health.

Resumen

Antecedentes: la obesidad entre los niños es un problema de salud cada vez mayor tanto en los países desarrollados como en los países en desarrollo, es uno de los problemas más destacados del siglo XXI que está vinculado a numerosas comorbilidades.

Pacientes y métodos: Noventa y seis participaron en esta encuesta, veintisiete tenían menos de 6 años y sesenta y nueve tenían entre 6 y 18 años. Todos tenían un IMC superior al 95% para su edad y sexo, se estimaron clínicamente como niños obesos. Posteriormente a la obtención del consentimiento se realizó la anamnesis, exploración física e investigación de las pruebas de laboratorio más relevantes. Resultados: Hay una diferencia significativa en el grupo de edad promedio de los dos grupos, la hipercolesterolemia y los niveles altos de triglicéridos fueron más reportados entre los pacientes mayores de 6 años. La hipertensión, los impactos psicológicos, la apnea del sueño, la enfermedad por reflujo gastroesofágico se notifica de manera más significativa entre el grupo de mayor edad (> 6 años). La anemia por deficiencia de hierro y el asma se correlacionaron más significativamente con el grupo más joven (<6 años). Las anomalías de las enzimas hepáticas, cálculos biliares, dolor musculoesquelético no muestran diferencias estadísticas entre los dos grupos.

Palabras Clave: La carga de la obesidad; salud infantil.

Introduction

Childhood obesity is an escalating health issue in both developed and developing countries sparing only regions with chronic deprivation[1,2], it's one of the prominent confront of the 21 century[3].

Obesity among children is allied to earnest complication that embrace a high chance of ill health and early death[4].

Actually it may even threaten health of children and may persist to have adverse influence to adulthood[5,6]. The

modern way used to assort persons as (obese) is by Body Mass Index BMI), as it estimates adipose tissue and body fat bulk, it is delineated by the ratio of weight in kilograms) to the square meter of height (meters)[7].

In accordance with CDC guidelines that determined at 2008, BMI of pediatric age group alter with their growth consequently chart of their age and gender were accustomed[8].

In pediatric age group the joining of adiposity "true fat deposition "to BMI may be less tight than adult. therefore, they are outlined as obese when their BMI seem above their specific centile for age and gender[9].

During childhood period, levels of body fat alter starting with high level during infancy then decrease to about 5.5 years until the period termed adiposity rebound, as body fat is naturally at nadir level but then increases until early adulthood. Hence, obesity and overweight are determined by using BMI percentiles[10].

children older than 2 years old with a BMI ≥95th percentile join the criteria for obesity, while those with a BMI between the 85th and 95th percentiles termed as overweight[10], this were recently assorted by the institute of medicine[11].

Obesity is considered a sophisticated multifactorial health problem that influenced by many genetic and environmental points[12,13].

It is well known that increment in obesity is a result of poor balance between intake and expenditure, this had been hardly joined to life style assumed and dietary habits[14]. High caloric diet, sedentary life style, television watching in addition to overuse of electronic games has been blamed to the rising in obesity prevalence in the recent years[15-17].

Monitoring and control of food intake arise by neuroendocrine feedback system joining adipose tissue, central nervous system and gastrointestinal tract[10].

Genetic determinants may play a role in adiposity such as FTO gene blamed in aiding increasing intake. 10 Genetic vulnerabilities often require to be joined with associated environmental personal behavior to affect weight[14].

Many genetic syndromes are also associated with this problem such as prader-willi and ROHHAD syndrome[10].

Many organic causes are also blamed like hypothyroidism, cushing syndrome, GH deficiency, hyperinsulinism and pseudohypoparathyroidism[10,18].

Many prenatal influence affect obesity including maternal obesity and maternal smoking, gestational diabetes, large for gestational age[19]. Breast feeding is considered modestly protective[20,21].

Hispanic and south Asia, children from urban areas have a higher risk for overweight and obesity[22-24].

Females are also at higher risk of obesity than males secondary to their hormonal status[25]. Those with low and mid socioeconomic status are also at higher risk[26,27,28].

A suggestion about the role of microbial infection in obesity, adeno virus Ad 36 infection and the gut composition (ratio of firmiculate to bacteroid) are suggested to have an associate[29].

Depression can be a cause or a result of obesity[30]. Obesity among children can intensely affect their emotional, physical and social well-being. It's also affect their self-esteem[31]. Poor academic achievements are also seen frequently among them[32].

Comorbidities are seen during childhood and adolescence; it's also persist to adulthood. There is higher morbidity and mortality among those patient which raise the importance of prevention and treatment[10].

Type 2 DM, hyperlipidemia, hypertension and non-alcoholic fatty liver disease are immediate complications. Insulin resistance aids adiposity and affects lipid metabolism causing cardiovascular disease[33,34].

Hypertension and dyslipidemia were seen 8.5 folds more among overweight than lean children[35].

OSA was seen 6 folds more among obese children than non-obese[36], asthma prevalence is also more reported among obese[37], other comorbidities are gall stone, sleep apnea, asthma, nutritional deficiency and some orthopedic problems. there is also a possibility of chronic inflammation secondary to low adiponectin level in those patients[38].

Musculoskeletal pain and Blount disease are well-known orthopedic health problems for them[38].

NAFLD occurs in 10 -25% of them. Liver function test is strongly considered to be obtained for obese patients as they are typically asymptomatic[39,40]. If ATL is two times more than normal for more than 3 months, abdominal US is sometimes mandatory to affirm the diagnosis[39,41].

Socially obesity is considered as a stigmatizing and socially an acceptable condition. patients may be excluded from many activities in particular competitive sports[34].

Management should involve the principles of primary and secondary prevention as primary one is important in prevention of obesity while the secondary is essential to minimize complications[42].

Pharmacotherapy is usually limited to selected patients in particular those with significant morbidities[42]. The only FDA-approved drug for children younger than 16 years is orlistat, which is lipase enzyme inhibitor. It decreases fat absorption and aids weight loss moderately[10].

There are another promising combination (amylin + leptin), the former decreases intake and slows gastric emptying while the other has anorexigenic effect when given as a combination[10].

If insulin resistance is clinically confirmed, Metformin may be prescribed[43,44].

Octreotide for hypothalamic obesity, its used to suppress insulin and stabilize BMI[45,46].

Regarding bariatric surgery, it's should be limited to patients who has complete or near-complete skeletal maturity, has BMI more than or equal to 40, presence of comorbidities, failure of 6 months' trial of weight reducing program[10,47,48].

It may carry many complications that vary from wound infection to life threatening complication such as intestinal obstruction and perforation[10].

Management of comorbid disease is required accordingly[10].

Aims of the study

1. To determine the impact of obesity on children health.

2. To find out any association between these morbidities and age groups.

Results

Ninety-six patients aged 2-18 years were enrolled in this survey. Twenty-seven of them were less than 6 years and 69 were more than 6 years. all of them had a BMI >95% for age and gender and were clinically diagnosed with obesity.

Data collected over 1-year period from the 1st of November 2018 to the 30th of November 2019.

The patients were identified as part of their need to medical care, most of the families were unaware of their child health problem and many escape the survey and were excluded.

Consent acquisition was obtained for all patients involved, we start with the evaluation of centile charts. Detailed history about family eating habit, level of physical activity, residency, education level and socioeconomic status.

Focusing on clinical sign of comorbid disease, psychological status of the patient, symptom of OSA, asthma, GERD, iron deficiency anemia, musculoskeletal pain, gall bladder disease.

Blood pressure was measured for all patients with appropriate sized cuff. Many lab investigations were performed for all patents such as hemoglobin, serum iron, TIBC, random blood sugar, liver enzymes (ALT, AST), serum cholesterol, serum triglyceride.

Abdominal ultrasound was performed to selected patients (those with abnormal liver function test and patients with symptoms of gall bladder disease).

Statistical analysis

Data were analyzed using statistical package for social science (SPSS) (IBM, Chicago, USA, version 23). Quantitative variables were expressed as mean, range and standard deviation; whereas, qualitative variables were expressed as number and percentage. Independent samples t-test was used to compare mean between two groups, while chi-square test and Yates correction for continuity were used to assess difference in frequency distribution of qualitative variables between groups. The level of significance was set at P ≤ 0.05 and the level of high significance was set at P ≤0.01.

Methods

The demographic characteristics of children enrolled in this study were outlined in table 1. The study included obsess children with body mass index ≥ 95% for age and gender, who were categorized according to age into two groups, the first group included children 6 years or younger and the other group included children who were > 6 years.

There was highly significant difference in mean age between the two groups (P < 0.001), no significant difference in gender distribution (P = 0.407), significant difference in distribution according to residency (P = 0.017), and no significant difference in socioeconomic status (P = 0.309), as shown in table 1.

Table 1. Demographic characteristics of obese children enrolled in this study

Characteristic	Age < 6 years n = 27	Age > 6 years n = 69	P
Age (years)			
Mean ±SD	3.93 ±1.24	12.20 ±3.04	< 0.001 † HS
Range	2 -6	7 -18	
Gender			
Male, n (%)	17 (63.0 %)	37 (53.6 %)	0.407 ¥ NS
Female, n (%)	10 (37.0 %)	32 (46.4 %)	
Residency			
Urban, n (%)	14 (51.9 %)	53 (76.8 %)	0.017 ¥ S
Rural, n (%)	13 (48.1 %)	16 (23.2 %)	
Socioeconomic status			
Poor, n (%)	9 (33.3 %)	16 (23.2 %)	0.309 ¥ NS
Good, n (%)	18 (66.7 %)	53 (76.8 %)	

n: number of cases; †: Independent t-test; ¥: Chi-square test; HS: highly significant at P ≤ 0.01; NS: Not significant at P > 0.05; S: significant at P ≤ 0.05

Biochemical abnormalities were shown in table 2. Hypercholesterolemia, hypertriglyceridemia and impaired glucose tolerance were significantly more frequent in obese children more 6 years of age in comparison with children

6 years or less (P<0.001); however, there was no significant difference in the frequency of liver enzyme abnormalities between the two groups (P = 0.398), table 2.

Table 2. Biochemical abnormalities according to age

Characteristic	Age < 6 years n = 27	Age > 6 years n = 69	P
Serum Cholesterol			
Normal, n (%)	23 (85.2 %)	28 (40.6 %)	< 0.001 ¥ HS
High, n (%)	4 (14.8 %)	41 (59.4 %)	
Serum triglyceride			
Normal, n (%)	23 (85.2 %)	31 (44.9 %)	< 0.001 ¥ HS
High, n (%)	4 (14.8 %)	38 (55.1 %)	
Fasting blood sugar			
Normal, n (%)	21 (77.8 %)	20 (29.0 %)	< 0.001 ¥ HS
High, n (%)	6 (22.2 %)	49 (71.0 %)	
Liver enzymes			
Normal, n (%)	26 (96.3 %)	63 (91.3 %)	0.398 ¥ NS
High, n (%)	1 (3.7 %)	6 (8.7 %)	

n: number of cases; ¥: Chi-square test; HS: highly significant at P ≤ 0.01; NS: Not significant at P > 0.05

Hypertension, psychological abnormalities, sleep apnea, gastroesophageal reflux disease (GERD) were significantly more frequent in obese children more 6 years of age in comparison with children 6 years or less (P < 0.001): while asthma and iron deficiency anemia (IDA) were more significant to the younger age group ; however, there was no significant difference in the frequency distribution according gall bladder disease and musculoskeletal disorders between both groups (P > 0.05), as shown in table 3.

Table 3. Chronic medical disorders according to age

Characteristic	Age < 6 years n = 27	Age > 6 years n = 69	P
Hypertension			
Positive, n (%)	2 (7.4 %)	27 (39.1 %)	0.002 ¥ HS
Negative, n (%)	25 (92.6 %)	42 (60.9 %)	
Psychological			
Abnormal, n (%)	1 (3.7 %)	19 (27.5 %)	0.010 ¥ HS
Normal, n (%)	26 (96.3 %)	50 (72.5 %)	
Gall bladder disease			
Positive, n (%)	1 (3.7 %)	1 (1.4 %)	1.000 Y
Negative, n (%)	26 (96.3 %)	68 (98.6%)	
Asthma			
Positive, n (%)	8 (29.6 %)	3 (4.3 %)	0.002 Y HS
Negative, n (%)	19 (70.4 %)	66 (95.7 %)	
Sleep apnea			
Positive, n (%)	5 (18.5 %)	45 (65.2 %)	< 0.001 ¥ HS
Negative, n (%)	22 (81.5 %)	24 (34.8 %)	
GERD			
Positive, n (%)	1 (3.7 %)	23 (33.3 %)	0.003 ¥ HS
Negative, n (%)	26 (96.3 %)	46 (66.7 %)	
MS pain			
Positive, n (%)	2 (7.4 %)	14 (20.3 %)	0.223 Y NS
Negative, n (%)	25 (92.6 %)	55 (79.7 %)	
IDA			
Positive, n (%)	26 (96.3 %)	24 (34.8 %)	< 0.001 ¥ HS
Negative, n (%)	1 (3.7 %)	45 (65.2 %)	

n: number of cases; ¥: Chi-square test; Y: Yates correction; HS: highly significant at P ≤ 0.01; NS: Not significant at P>0.05

Discussion

Childhood obesity is recently considered to be a major growing health problem that has many adverse effects on children health[49].

In this study, the patients involved were classified in to two groups (2-6 years) and (6-18 years), mean age was higher among the older age group which may reflect that the risk of obesity increases with age and it's a real progressing issue that once occur it may increase with time.

This was consistent to a study at Al Basrah city in Iraq where it found that the risk of overweight and obesity increases from 17.8% at 8 years to 30.4% at 11 years old. [50] It's also seen by many other studies[51-57].

By Nablus and Costo Rican study, the prevalence was highest among those 7-9 years old[58,59].

Gender was not significantly varying between the two age group, which is consistent with 2 studies in Iraq and one Italian study which may reflect that dietary habit among societies and their life style is the determinant rather than gender[50,52,60]. Some studies have shown more male preponderance[58,59,61]; others show female preponderance as a risk factor[56,62,63].

Regarding residency, there is significant correlation between obesity and urban residency among older age group that is consistent with Riyadh et al study in Iraq[52] and Zugue et al in USA[64], Friedrik et al[65], Behrman et al[66] who found that trends were more marked and consistent with urban residency which can be explained by the more marked un healthy life style.

On evaluating the correlation between socioeconomic status and obesity, its more pronounced with good status but no significant difference between the two groups. The parallel correlation was also noted by a study in AL Basrah city[50].

By many other studies, the result was on the reverse[67-69].

By others its seems that in lower income countries, the higher socio-economic status, the more rate of obesity, while in high income countries they are less likely to be obese[70], this may reflect that the low income society high income persons have higher tendency to consume high carbohydrate diet and to have less physical activity, and the opposite for high income society.

Impaired glucose tolerance, dyslipidemia, hypertension,

sleep abnormalities were reported more significantly among the older age group as obesity-related adverse health effect that increases with severity and chronicity of obesity[71-74].

Elevated liver enzymes were still reported in both groups with higher percent among older one but no statistical significance between them. It's still a reported health problem of obese patient by many other studies[75].

Gall bladder stones was also seen in our patient of both groups but it's considered less to be reported among children and adolescents, similarly musculoskeletal pain had no statistical significance, it is a subjective problem that depend on patient pain threshold and severity of obesity rather than age group[76,77].

Only asthma and iron deficiency anemia were found to be significantly seen among the younger one.

Asthma among obese patients is still an increasing problem among obese by 2 fold than non-obese. Being higher in younger age may be related to the higher rate of asthma in general among younger rather than secondary to obesity[78-81].

Iron deficiency anemia may be a reflective to poor dietary iron intake and impaired iron absorption being more pronounced among younger age group. Its seen that the prevalence of iron deficiency increases as BMI increase[80-83].

Conclusions

Obesity is a real recent health problem among children and adolescents with many negative impacts on their health.

Increasing awareness about the consequence of obesity is crucial in our society.

Social education about prevention methods is the main step in controlling this disease and its consequences.

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